

19  
4. (Amended) A method for analyzing a semiconductor die, the method comprising:  
heating at least a selected portion of state-changing circuitry in the semiconductor die to cause a failure due to suspect circuitry, the state-changing circuitry including a suspect signal path site;  
detecting, in response to the selected portion being heated, a state-changing transition between a failed mode and a recovered mode in the suspect signal path site;  
using the detected state-changing transition, determining that the signal path site has a resistivity that changes between the failed mode and the recovered mode;  
electrically operating the die to cause the circuitry to change state in response to at least one of: an input frequency, a controlled voltage supplied to the die and a controlled die temperature; and  
electrically operating the die in a loop that causes the die to fail at a selected failure rate.

15  
16  
21. (Amended) The system of claim 20, wherein the display includes an image contrast amplifier, and wherein the detector includes an output adapted to supply a control signal to the image contrast amplifier in response to the transition between the failed mode and the recovered mode.

#### Remarks

Favorable reconsideration of this application is requested in view of the following remarks. For the reasons set forth below, Applicant respectfully submits that the claimed invention is allowable over the cited references.

The Office Action dated November 18, 2002, indicated that Figure 1 is objected to; claim 21 is objected to for an informality; claims 1-3, 6-16 and 18-23 stand rejected under §102(e) as being anticipated by *Nikawa* (U.S. Pat. No. 6,160,407); claim 9 stands rejected under § 103(a) as being unpatentable over *Nikawa* in view of *Yue et al.* (U.S. Pat. No. 5,504,017); claims 10, 22 and 23 stand rejected under §103(a) as being unpatentable over *Nikawa* in view of *Paniccia et al.* (U.S. Pat. No. 5,872,360); claims 4-5 are objected to as

being dependent upon a rejected base claim but would be allowable if rewritten in independent form; and claim 17 is allowed.

Applicant appreciates the allowance of claim 17.

With respect to the objection to claims 4 and 5, Applicant has amended claim 4 to be in independent form including all limitations of the base and intervening claims. Applicant submits that the objection is overcome and both claims are in condition for allowance as claim 5 depends upon claim 4.

With respect to the drawing objection, Applicant has enclosed one sheet of proposed drawing corrections including labels written in red ink for each box of Figure 1.

With respect to the objection to claim 21, Applicant has amended the claim in accordance with the Examiner's suggestion to include a period at the end of the claim.

With respect to the rejections of the independent claims, Applicant respectfully traverses and submits that the asserted interpretation of the '407 reference is erroneous. Applicant's invention, as claimed, includes limitations directed to identifying the specific circuit paths that electrically change in response to heat and detecting that a particular circuit portion therein is resistive -- using a state-changing operation of a suspect circuit to cause its failure. The '407 reference does not use a state-changing operation of a suspect circuit to cause its failure, as claimed. The Office Action's citations to the '407 reference in this regard are incorrect. The citations at page 3 of the Office Action, referring to columns 4 and 8, are merely directed to "local heating of the wiring" (Col. 4, lines 15-16) for the purpose of determining a potential flaw somewhere in the integrated circuit. This local heating does not involve state-changing operations of such suspect wiring. Similarly, the citations to columns 15 and 16 of the '407 reference describe a defective IC detection approach in which OBIRCH signals are used to make a judgment whether the IC's current drain value is unusual or not. *See* Col. 16, lines 51-53. The '407 reference specifically teaches that an area as wide as possible should be scanned to make the detection of a failure easier. *See* Col. 16, lines 20-25. Thus, the rejection is flawed because state-changing operations of the suspect circuit are not used to detect a particular circuit portion therein that is resistive. Rather, the '407 reference employs the visible laser generating beam section 51 and the microscope section 52 to further localize a defective wiring portion. *See* Col. 15, lines 58-61.

Moreover, with respect to the rejections of claims 2, 3, 6-8, 11-14 and 18, in addition to the above noted distinctions, the cites at columns 15-16 do not correspond to the limitations concerning state-changing transitions between failed and recovered modes. If the Examiner has an understanding of this cited teaching that differs, Applicant respectfully requests clarification with specific correlation to these limitations, *e.g.*, claim 2, lines 5-9.

Applicant respectfully traverses the §103(a) rejection of claim 9 as the Office Action fails to present a *prima facie* case of obviousness. In order to establish a *prima facie* case of obviousness, the Office Action must present a teaching of prior art references so as to provide complete correspondence to the claimed invention and evidence of motivation for combining the prior art references as asserted. The Office Action fails to meet each of the requirements.

The Office Action fails to present a combination of references that completely correspond to the claimed invention. Claim 9 is directed to a method of analyzing a semiconductor die including, *inter alia*, “detecting a change in a failure rate of the circuit path during a state-changing operation.” The Office Action acknowledges at page 4 that the ‘407 reference fails to teach these limitations. In an attempt to overcome this deficiency, the Office Action erroneously refers to two portions of the ‘017 reference. The cited portions of the ‘017 reference are directed to a teaching that failure rates may be high, but neither portion teaches detecting a change in failure rate, as claimed. In view of the above discussion regarding the ‘407 reference’s lack of correspondence to the claimed invention and the fact that the ‘017 reference fails to teach the asserted claim limitations, Applicant submits that the rejection is improper and should be withdrawn.

Applicant also submits that the Office Action fails to present evidence of motivation in support of the proposed modification of the ‘407 reference. Evidence has not been provided of any teaching or suggestion for using the ‘407 reference in connection with detecting a failure rate change, as claimed in the instant invention, or for modifying the reference to achieve the claimed limitations. Recent case law indicates that evidence of motivation must be specifically identified and shown by some objective teaching in the prior art leading to the modification. “Our court has provided [that the] motivation to combine may be found explicitly or implicitly: 1) in the *prior art*

*references* themselves; 2) in the knowledge of those of ordinary skill in the art that certain *references*, or disclosures in those references, are of special interest or importance in the field; or 3) from the nature of the problem to be solved, 'leading inventors to look to *references* relating to possible solutions to that problem.'" Ruiz v. A.B. Chance Co., 234 F.3d 654, 57 U.S.P.Q.2d 1161 (Fed. Cir. 2000). The Office Action fails to identify evidence of why one skilled in the art would be led to modify the '407 reference, and does not provide any evidence of factual teachings, suggestions or incentives from the prior art that lead to the proposed modification. Applicant requests that the rejections be withdrawn.

Applicant also respectfully traverses the §103(a) rejection of claims 10, 22 and 23 as the rejections are improper because the proposed modification would undermine the purpose of the '407 reference. The '407 reference is directed to a "non-destructive" method of analyzing circuit wiring. *See* Col. 3, lines 5-8, and Col. 4, lines 34-38. The '407 reference teaches heating the die to determine whether a failure exists (*see* Figs. 21 and 23, S142-S147 and S152-S154 respectively), and only if a failure is detected, the chip is inspected using the visible-beam-microscope arrangement to determine where the failure occurs. By first thinning the die the die will be destroyed before it can be determined that the die is defective. This is directly contrary to the object of the '407 reference and directly contrary to the operation taught therein (*see e.g.*, Col. 18, lines 35-48). To allege under §103 that a skilled artisan would modify the '407 reference in such a manner is untenable and impermissible under §103. *See, e.g., In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984) (A §103 rejection cannot be maintained when the asserted modification undermines the purpose of the main reference.)

Moreover, the Office Action asserts a combination of reference teachings that would undermine another important aspect taught by the '407 reference. The Office Action citations refer to the fifth embodiment of the '407 reference wherein the device under test (DUT) is never removed from the support structure of the testing/inspection system of Figure 20. *See* Figs. 20-21, and discussion at col. 15-17 (*e.g.*, column 15, lines 60-62). In order to thin the back side of the DUT, the DUT would have to be removed from the test/inspection system, thinned, and then placed back in the system. This

modified process directly contradicts the '407 teachings and advantages of the fifth embodiment.

The above discussion presented in connection with the cited prior art merely sets forth reasons as to why the rationale presented in the Office Action fails to align and correspond the cited prior art with the invention as claimed, as required by 35 U.S.C. §102/§103. No amendments were made to the claims with respect to the asserted references and it is believed that, after a careful review of the cited art, no arguments should be required to explain why the cited art is significantly different from the claimed invention relative to the amendment made to claim 1. The amendment made to claim 1 merely adds the word "while" so as to further emphasize the already-implicit relationship between the interactive words "using" and "identifying." Consistent with the case law, this amendment does not change the claim scope and is not introduced to overcome any issue of patentability but, rather, merely manifests Applicant's long-accepted right to press alternative claim forms. Applicant respectfully submits that, by way of this Office Action Response, there is no intention to narrow, nor has the Applicant narrowed, the breadth of the claims through the explanatory comments provided herein.

Please charge Deposit Account No. 01-0365 (TT3843) in the amount of \$84.00 for the new independent claim and charge/credit the same Deposit Account No. for any deficiency/surplus.

In view of the remarks above, Applicant believes that each of the rejections has been overcome and the application is in condition for allowance. Should there be any remaining issues that could be readily addressed over the telephone, the Examiner is encouraged to contact the undersigned at (651) 686-6633.

Respectfully submitted,

CRAWFORD MAUNU PLLC  
1270 Northland Drive, Suite 390  
St. Paul, MN 55120  
651/686-6633

By: 

Robert J. Crawford  
Reg. No. 32,122

Dated: February 7, 2003

**Claim Changes for S/N 09/586,518**

1. (Amended) A method for analyzing a semiconductor die having suspect circuitry that includes a multitude of circuit paths, the method comprising:

while using a state-changing operation of the suspect circuitry to cause a failure due to the suspect circuitry, identifying one of the circuit paths that electrically changes in response to heat and detecting that a particular circuit portion therein is resistive.

4. (Amended) [The] A method [of claim 3, further] for analyzing a semiconductor die, the method comprising:

heating at least a selected portion of state-changing circuitry in the semiconductor die to cause a failure due to suspect circuitry, the state-changing circuitry including a suspect signal path site;

detecting, in response to the selected portion being heated, a state-changing transition between a failed mode and a recovered mode in the suspect signal path site;

using the detected state-changing transition, determining that the signal path site has a resistivity that changes between the failed mode and the recovered mode;

electrically operating the die to cause the circuitry to change state in response to at least one of: an input frequency, a controlled voltage supplied to the die and a controlled die temperature; and

electrically operating the die in a loop that causes the die to fail at a selected failure rate.

21. (Amended) The system of claim 20, wherein the display includes an image contrast amplifier, and wherein the detector includes an output adapted to supply a control signal to the image contrast amplifier in response to the transition between the failed mode and the recovered mode.